

Write your name here

Surname

Other Names

AS/A Level Mathematics

Velocity-Time Graphs

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled..
- Answer the questions in the spaces provided
– there may be more space than you need.
- You should show sufficient working to make your methods clear.
Answers without working may not gain full credit.
- Answers should be given to three significant figures unless otherwise stated.

Information

- The marks for **each** question are shown in brackets
– use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

- 1 A train accelerates from rest at station A to a velocity of 32ms^{-1} . It maintains this speed for 72 seconds, until it decelerates uniformly to station B. The total journey time is 112 seconds and the magnitudes of the acceleration and deceleration are equal.

Find

- (a) the time it takes the train to accelerate from rest to 32ms^{-1} , (2)
- (b) sketch a velocity-time graph for the motion of the train between station A and station B, (2)
- (c) calculate the distance between the two stations. (3)

(Total for question 1 is 7 marks)

- 2 A train moves along a straight horizontal track between two stations, A and B. The train starts from rest and moves with acceleration of 0.6ms^{-2} for 40 seconds. The train then moves at a constant speed before decelerating at a rate of 0.4ms^{-2} until it reaches B.

The total distance between the two station is 4 km.

- (a) sketch a velocity-time graph for the motion of the train between A and B, (3)
- (b) find the total time taken by the train to travel from A to B. (3)

(Total for question 2 is 6 marks)

- 3 A particle, moving in a straight line with speed $5U\text{ms}^{-1}$, decelerates uniformly for 6 seconds which reduces its speed to $2U\text{ms}^{-1}$. It maintains this speed for a further 16 seconds before decelerating uniformly to rest in a further 2 seconds.

- (a) sketch a velocity-time graph for this information, (2)
- (b) find an expression for each of the decelerations in terms of U. (4)

Given the total distance is 220m

- (c) find the value of U. (6)

(Total for question 3 is 12 marks)

- 4 A car starts from rest and accelerates at a constant rate to the speed of $V\text{ms}^{-1}$ in 6 seconds. The car maintains this speed for 50 seconds before decelerating to rest. The magnitude of the deceleration is 1.5 times this magnitude of the acceleration.

- (a) show the total time taken for the journey is 60 seconds, (3)
- (b) sketch a velocity-time graph for this information, (3)

Given the total distance is 1320m

- (c) find the value of V. (3)

(Total for question 4 is 9 marks)